Q10 p61

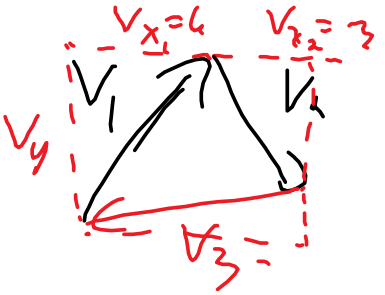
Wednesday, September 28, 2016 10:16 AM

x, y, z

$V_1 = (6, 0, 8)$

$V_2 = (3, 4, -3)$

$V_3 = (-9, -4, -5)$

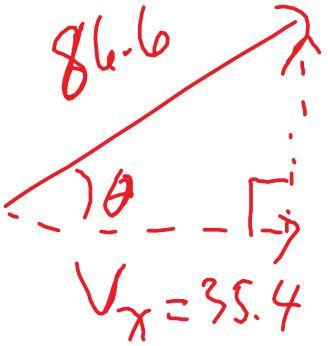


b) $V_1 = (6, 0, 8)$

$-V_2 = (-3, -4, +3)$

$V_3 = (-3, +4, -11)$

Q17



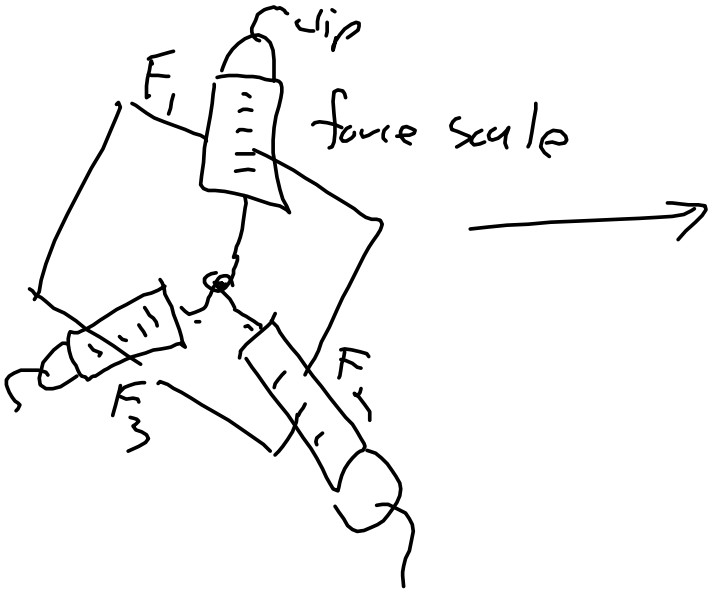
$V_y = ? \sqrt{86.6^2 - 35.4^2}$

$= \boxed{79.0}$

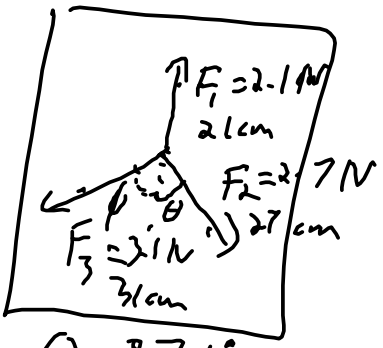
$\theta = \cos^{-1}\left(\frac{35.4}{86.6}\right) = \boxed{65.8^\circ \text{ to the } x\text{-axis}}$

Lab - not formal - no report
Hand in:

1. Free body diagram of the 3 forces.



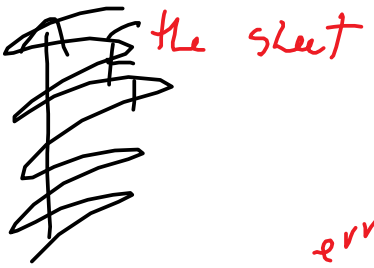
scale 1N=10cm



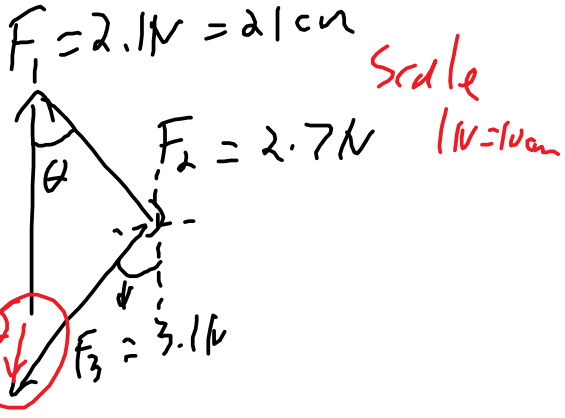
$\theta = 37.1°$
$\phi = 42.7°$

Free body diagram
- shows forces

2. Convert the free body diagram into a vector addition diagram.
   Draw F1 in the same direction but draw F2 head to tail with F1, then draw F3 head to tail.
   The space remaining on the diagram is the error.



Back of the sheet



Scale 1N=10cm

imagine it with a ruler

$$\%\ \text{error} = \frac{\text{error}}{\frac{|F_1| + |F_2| + |F_3|}{3}} \times 100\%$$

3. Calculate the components of each vector and the sum of the components = error.

F1 should have no x component, only y.
F2x = F2 sin θ
F2y = -F2 cos θ
F3x = -F3 sin ϕ
F3y = -F3cos ϕ

all good?
Fx = F1x + F2x + F3x
Fy = F1y + F2y + F3y

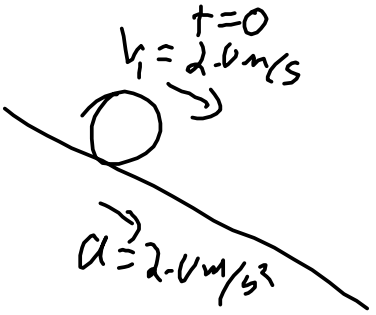
error = root(Fx^2 + Fy^2)

Quiz answers version 1
1a) 1.783x3.45=6.1514 = 3 sig figs 6.15 m^2
b) 0.00056+0.06001=0.06057 kg
c) 5.5014x1.90=10.4527 x10^5 = 1.05 x 10^6 s^2

1'. 5004 ms
9 90 ms
11.4004

11.40ms

Q2 a)



a) v_i = 2.0m/s
t = 2.0s
a = 2.0m/s²
v_f = ?

$v_f = v_i + at$
= 2.0m/s + 2.0m/s² (2s)
= 6.0m/s

b) d = 20 cm
t = ?
a = 2.0m/s²

$d = \frac{1}{2}at^2 + v_i t$

$v_i = 2.0\ m/s$

$2v = t^2 + 2t$

$0 = t^2 + 2t - 20$ 9.165

$t = \frac{-2 \pm \sqrt{4 - 4(-20)}}{2}$

$t = 3.58\ s$ $= t = 3.6\ s$

$v_f^2 = v_i^2 + 2ad$

$v_f = at + v_i$

c) $d = d$

$10\ m/s\,(t-1) = \frac{1}{2}(2\ m/s^2)t^2 + 2\ m/s\ t$

$10t - 10 = t^2 + 2t$

$0 = t^2 - 8t + 10$ 4.89

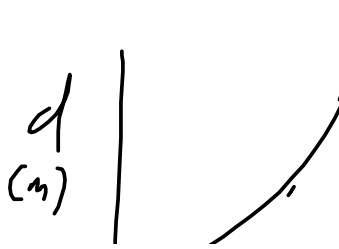
$\frac{8 \pm \sqrt{64 - 4(10)}}{2}$

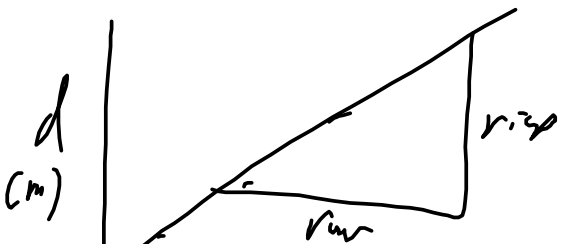
$\frac{8 - 4.89}{2} = 1.5505\ s$

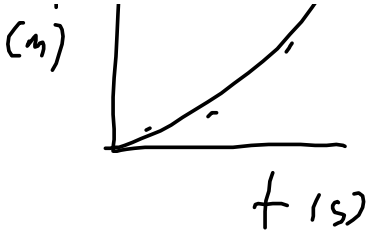
$v=0$ $d = 10\ m/s\,(1.5505\ s - 1\ s) =$ 5.5m

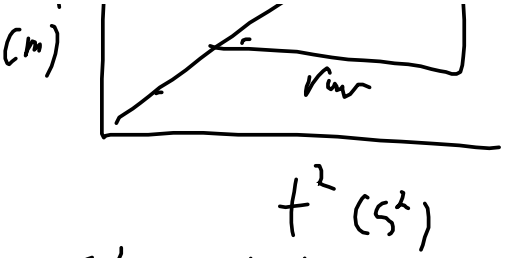
d) 29m $t = ?$ $d = \frac{1}{2}at^2$

$t = 0.77\ s \times 2 =$ 1.5 s







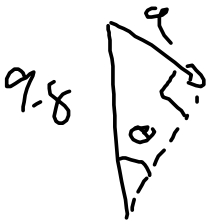


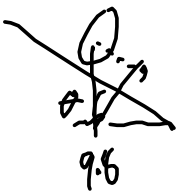
slope = 4.0 m/s²

$d = \frac{1}{2} a t^2$

equation $d = 4.0\ m/s^2\ t^2$

Bonus. $a = 2 \times \text{slope} = 8.0\ m/s^2$



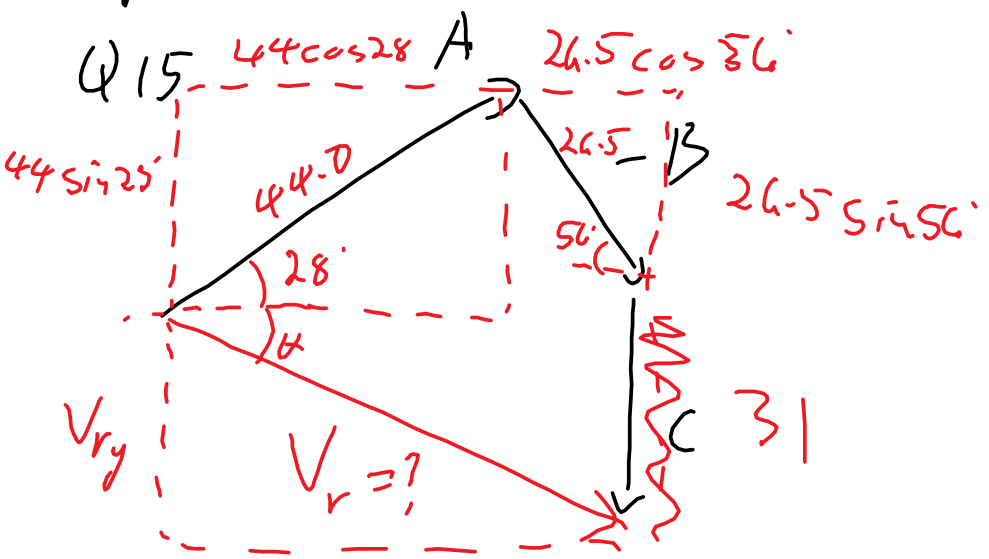


$a = g \sin\theta$

$\theta = \sin^{-1} \frac{8}{9.8} = 54.7°$

Lab - 2 diagrams and components
Labbook q 1-5 p38-39
Answers are at the back, but show your work

Pb 1



$V_{rx} = 44\cos 28 + 26.5\cos 56$

$14.82 = 5367$

$V_{rx} = 44\cos 28 + 24.5\cos 56$

$= 38.85 + 14.82 = 53.67$

$V_{ry} = 44\sin 28 + 24.5\sin 56 + 31$

$-20.66 + 21.97 + 31 = 32.31$

$V_r = \sqrt{V_{rx}^2 + V_{ry}^2} = \sqrt{53.67^2 + 32.31^2} = 63$

$\phi = \tan^{-1}\frac{53.67}{32.31} = 59°$

$\theta = 90 - \phi = 31°$

Quiz version 2

1a) 2.783x3.45=9.6014 = 9.60 m^2

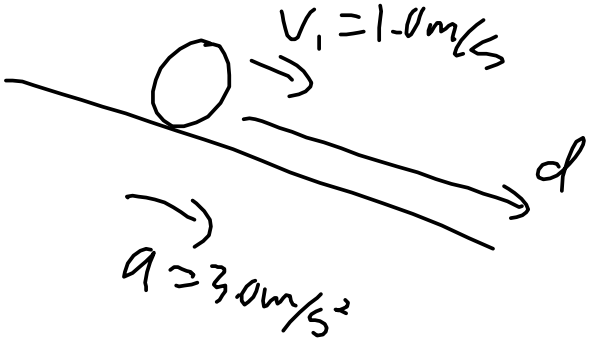
b) 0.00026+0.06001=0.06027 kg

c) 5.2014x1.90=9.8827 = 9.88x10^5 s^2

1.2004 ms

9.90 ms

11.1004 → 11.10 ms



a) $V_f = V_i + at$

$V_f = 1.0 m/s + 3.0 m/s^2 \cdot s$

$= 7.0 m/s$

b) $V_f^2 = V_i^2 + 2ad$

$V_f^2 = 1^2 + 2(3)(20)$

$V_f = \sqrt{121} = 11 \text{ m/s}$

$V_f = V_i + at \qquad 11 = 1 + 3t$

$\boxed{t = 3.3 \text{ s}}$

c) $d = d$

$10 \text{m/s}(t-1) = \frac{1}{2}at^2 + V_i t$

$10t - 10 = 1.5t^2 + t$

$0 = 1.5t^2 - 9t + 10$

$\frac{9 \pm \sqrt{81 - 4(1.5)10}}{2(1.5)} = \frac{9 \pm \sqrt{21}}{3}$

$t = 1.47 \text{ s}$

$d = Vt = 10 \text{m/s}(1.47 \text{s} - 1)$

$= \boxed{4.7 \text{m}}$

$\boxed{35.2 \text{m}}$

d) $d = 2.9 \text{m}$

$V_i = 0$

$d = \frac{1}{2}at^2$

$t = \sqrt{\frac{2(2.9)}{9.8}} = 0.77 \text{s} \times 2 = \boxed{1.5 \text{s}}$

c) d (m) vs t (s)

d (m) vs t^2 (s^2)

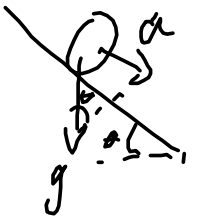
slope = 4.0 m/s²

$d = 4.0\ m/s^2\ t^2$

$d = \frac{1}{2} a t^2$

$a = 8\ m/s^2$

Bonus:



$\sin\theta = \frac{a}{g}$

$\theta = \sin^{-1}\frac{8}{9.8}$

$\theta = 54.7°$

Lab

scale free body diagram - force determines the length of the vector

scale vector addition diagram

components

Q1-5 p38-39 labbook - answers at the back

Quiz version 3

1a) 7.183x4.45=31.9644 = 32.0 m^2

3sf 3sf

b) 0.0076+0.07001=0.07761 = 0.0776 kg

to the 4th digit

c) 5.714x2.90=16.5706 1.66 x 10^6 s^2

1.7004 ms

+9.740 ms

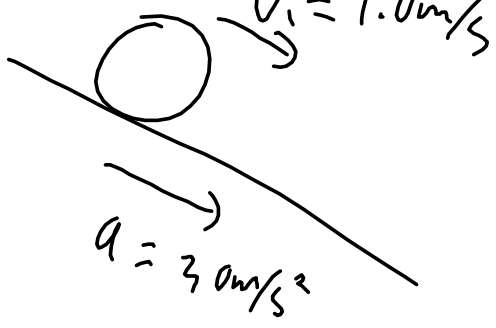
11.4004

11.40 ms

1.7004 ms
+ 9.70 ms
11.4004

11.40 ms

Q2



a) $V_f = ?$

$t = 2.0 s$

$V_f = V_i + at$

$V_f = 1.0 m/s + 3.0 m/s^2 (2.0 s)$

$= 7.0 m/s$

b) $d = 20 m$

$V_f^2 = V_i^2 + 2ad$

$V_f^2 = (1 m/s)^2 + 2(3 m/s^2)(20 m)$

$V_f^2 = 1 m^2/s^2 + 120 m^2/s^2$

$V_f = \sqrt{121 m^2/s^2} = 11.0 m/s$

$V_f = V_i + at \quad t = \frac{V_f - V_i}{a} = \frac{11.0 m/s - 1.0 m/s}{3.0 m/s^2}$

$= 3.3 s$

e) $d_{you} = d_{cheese}$

$V(t-1) = \frac{1}{2}at^2 + v_i t$

$10t - 10 = 1.5t^2 + t$

$0 = 1.5t^2 - 9t + 10$

$\frac{9 \pm \sqrt{81 - 4(1.5)10}}{2(1.5)} = \frac{9 \pm \sqrt{21}}{3}$ (4.583)

$= 1.47\,s$

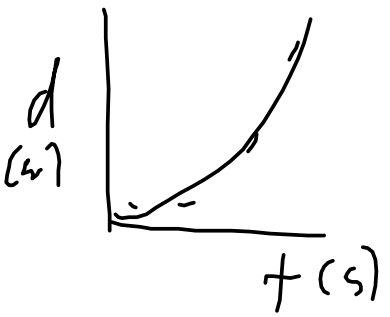
$d = V(t-1) = 10\,m/s\,(1.47\,s - 1.0\,s)$

$= 47\,m$

f) 2.9m, $v = 0$, v_i ↑

$d = \frac{1}{2}at^2$

$t = \sqrt{\frac{2(2.9)}{9.8}} = 0.769 \times 2 = 1.5\,s$



$m = 10\,m/s^2$

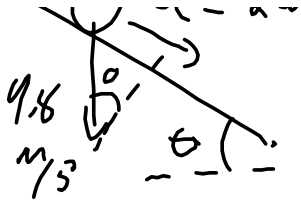
$d = 1.0\,m/s^2 \cdot t^2$

$\sqrt{d} = 1.0\frac{\sqrt{m}}{s}t$

Bonus:

$d = \frac{1}{2}at^2$

$a = 2.0\,m/s^2$



$a = 2.0 \text{ m/s}^2$

$\sin\theta = \frac{2}{9.8}$

$\theta = 11.8°$